Seed Set, Fruit Weight, and Yield in Highbush (*Vaccinium corymbosum* L.) Blueberry Cultivars 'Duke' and 'Bluecrop'

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Abstract

Growers often question whether small berry size is related to poor pollination and whether it is indicative of reduced yields. To answer this, yields and berry weights of two standard highbush blueberry cultivars, 'Duke' and 'Bluecrop', were evaluated for 3 (or more) harvests each season over ten years, and seed set was evaluated at each harvest over the last four. Across 10 years, yield and berry weight had no significant correlation. There was, however, indications of a relationship between seed/gfw and total yield. For the four years in which replicated seed counts were made, we found, in general, that for 'Bluecrop', berry weight and number of seeds/berry decreased linearly between first and third harvests. More importantly, berries with similar seed numbers varied in as weight as much 39% between years. Hence, reduced berry weight was not necessarily due to poor pollination. In 'Duke', results were erratic and berries with similar seed numbers varied in weight as much as 86% between years.

INTRODUCTION

Seed number bears a relatively strong relationship to fruit size (Eaton, 1967; Brewer and Dobson, 1969; Moore et al., 1972; El-Agamy et al., 1981), but it is not clear how this relationship varies year to year, or how it interacts with annual yield. This study aimed to examine these factors.

MATERIALS AND METHODS

All yield data was collected from research plots at a commercial grower location (Variety Farms, Hammonton, New Jersey) from 1998 to 2007 in a replicated planting of elite clones and standard cultivars, consisting of four replicates of five plants each in a randomized complete block design. Yield data was collected from 'Duke' and 'Bluecrop' on a weekly basis for the duration of their seasonal production. Berry weights were determined by taking ±200 g sub-samples from the 1st through 3rd weekly yield harvests, counting the fruit in those sub-samples, and calculating average berry weight. Those samples were then macerated with 1ml of commercial grade pectinase and digested overnight. Seed were then separated from the digested pulp by dilution and triple decantations with distilled water. After seed were thoroughly washed, they were dried on filter paper. Seed counts were made in triplicate on a Count-a-pak seed totalizer (Seedburo Equipment Co., Chicago, Ill.). Seed counts were made on the portion of dried seed that did not pass through a #26 mesh screen (i.e., >0.63 mm) when sieved.

RESULTS AND DISCUSSION

Yield versus Berry Weight

Based upon expected relationships between berry weight and yield, the most likely deviations for berry weight and yield would be low berry weight with high yield (over-cropped) or high berry weight with low yield (under-cropped) (upper left and lower right quadrants) (Fig. 1a, 2a). Less likely outcomes would be high berry weight with high yield (bumper crop?) or low berry weight with low yield (light crop without compensatory

pruning). All of these occur for both cultivars (Fig. 1a, 2a). Across 10 years, yield and berry weight had no significant correlation.

Yield and Seed Count

For the four years in which fully replicated seed counts were conducted, # of seed/gfw at first harvest and total yield had correlation values of r = 0.72 for 'Duke' and r = 0.83 for 'Bluecrop' (Fig. 1b, 2b). These values were not significant due to the small number of observations, but hint at a possibly significant relationship of seed count to yield. Inclusion of a limited-replication 5th year count (circled on graphs) adjusted these values to r = 0.80 for 'Duke' and r = 0.82* for 'Bluecrop'. If these values can be extended, they imply not only that pollination is critical to yield, in a normally-maintained bush, but also that only a limited amount of yield compensation via berry weight increase will occur if pollination is poor.

Seed Counts across Harvests and Across Years

1. Bluecrop. Berry weight and seed per fruit always decreased between successive harvests (Fig. 3). 'Bluecrop' showed a consistent positive trend between berry weight and seed per fruit summarized as: Seed number = 31.6 (berry weight in grams) – 23.1. Berries with similar seed numbers (extrapolated) varied in weight as much as 39% between years.

'Duke' had a less consistent trend between berry weight and seed per fruit across harvests (Fig. 4). Although seed number always decreased across sequential harvests, berry weight response was more erratic than in 'Bluecrop'. In two of four years, berry weight exhibited non-linear trends between the first and third harvest. The average response of 'Duke' summarized across years was: Seed number = 108.5 (berry weight in grams) 137.9. Berries with similar seed numbers (extrapolated) varied in weight as much as 86% between years. The lack of a consistent berry-weight trend between harvests suggests greater variability in 'Duke's response with respect to nutrient sources and sinks during the ripening period. It also implies that under favorable circumstances 'Duke' can produce later-harvest fruit with increased berry weight.

CONCLUSIONS

Across 10 years, yield and berry weight had no significant correlation, but seed/gfw may have a stronger relationship to yield than previously assumed. Pollination is a factor in berry weight, but limited plant resources and/or overcropping also effectively reduce berry size. In this study, it appeared that cultivars such as 'Duke' may even have sufficient environmental plasticity to produce fruit with increased berry weight across successive harvests given favorable inputs.

Literature Cited

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Figures

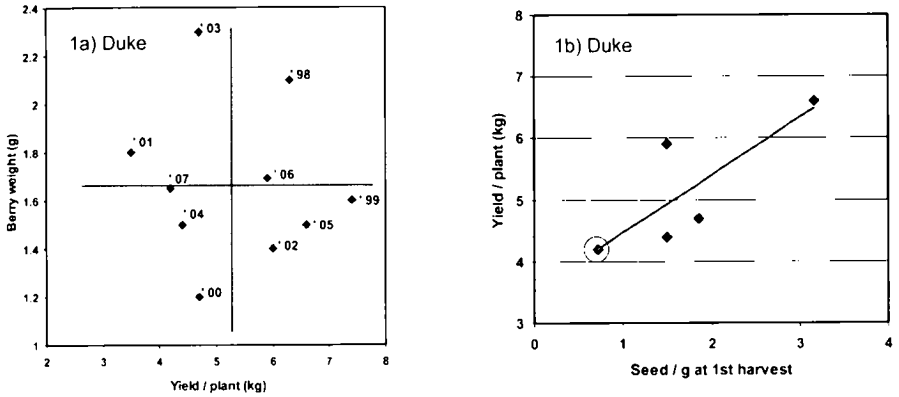

Fig. 1. a) Berry weight versus yield/plant and b) yield per plant versus seed/g at first harvest for 'Duke'.

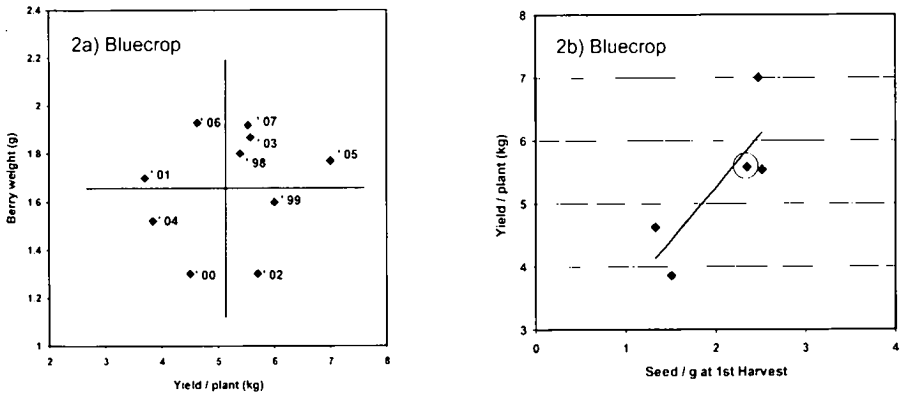

Fig. 2. a) Berry weight versus yield/plant and b) yield per plant versus seed/g at first harvest for 'Bluecrop'.